Questions on 2.7H HW? 2.6 HW is due today...no quiz...so get out your 2.7H and finish pages 46-47.

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8. A certain bacteria population is known to double every 15 minutes. An experiment is being conducted in a microbiology lab. Suppose there are initially 7 bacteria in a petri dish. Predict the size of the population after t hours.
Make a table, graph, and equation that will predict the number of bacteria in t hours.
Label the scale on both the x and y axes. The increments on the x-axis should be ¼ of an hour or less. Make sure you can fit at least 4 points on your graph.

7, 14, 28, 56, 112

Time in hours (4 periods of doubling per hour)	Number of bacteria
0	7
1	112
2	
3	
4	
5	

$7 \cdot 2^{4x}$ OR $7 \cdot 16^{x}$

Equation: $7 \cdot 2^{4x}$ or $7 \cdot 16^{x}$

9. Between what times to the nearest ¼ of an hour will the number of bacteria exceed 10,000?

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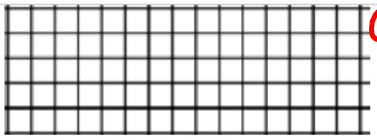
$\log_a b = y$

$a^y = b$



9. Between what times to the nearest ¼ of an hour will the number of bacteria exceed 10,000? 1,000,000?

10. Predict the number of bacteria after a 24 hour period. (Write your answer in scientific notation)

$A = 7 \cdot 16^x$

$A = 7 \cdot 16^{24} = 5.5 \times 10^{29}$

11. Write a logarithmic equation that would allow you to find the time t when there are 700 bacteria.

$\frac{700}{7} = \frac{7 \cdot 16^x}{7}$

12. Calculate the time when there are 700 bacteria. (Round your answer to 3 decimals.)

$100 = 16^x \rightarrow \log_{16} 100 = x$

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Secondary Mathematics III

50

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logarithm. Do not use a calculator to evaluate the logarithms.

13. $\log 12 \approx 1.1$ Find $\log \frac{2}{3}$.
$\log 8 \approx 0.9$
$\log 7 \approx 0.8$

14. $\log 12 \approx 1.1$ Find $\log \frac{1}{7}$.
$\log 8 \approx 0.9$
$\log 7 \approx 0.8$

15. $\log 12 \approx 1.1$ Find $\log \frac{7}{8}$.
$\log 8 \approx 0.9$
$\log 7 \approx 0.8$

16. $\log 12 \approx 1.1$ Find $\log \frac{3}{14}$. $= \log \frac{3 \cdot 4}{2 \cdot 7 \cdot 4}$
$\log 8 \approx 0.9$
$\log 7 \approx 0.8$
$\log \frac{12}{56} = \log \frac{12}{7 \cdot 8} =$
$\log 12 - \log(7 \cdot 8) =$
$\log 12 - (\log 7 + \log 8)$
$= 1.1 - (0.9 + 0.8)$
$=$

17. $\log_8 6 = 0.86$ Find $\log_8 729$.
$\log_8 9 = 1.06$
$\log_8 7 = 0.94$

18. $\log_8 6 = A$ Find $\log_8 729$.
$\log_8 9 = B$
$\log_8 7 = C$

19. $\log_8 6 = 0.86$ Find $\log_8 \frac{2}{3}$.
$\log_8 9 = 1.06$

20. $\log_8 6 = A$ Find $\log_8 \frac{14}{3} \cdot \frac{3}{3} = \log_8 \left(\frac{42}{9}\right) =$
$\log_8 9 = B$

$\log_8 7 = C$ $= \log_8 \left(\frac{6 \cdot 7}{3^2}\right) =$

$\log_8(6) + \log_8(7) - \log_8(9) =$

$\log_8 6 + \log_8 7 - \log_8 9 =$

$A + C - B$

Now you have received a report of a mysterious illness that seems to turn the infected humans into mindless zombies has broken out in a major American city. Since the hungry zombies prey upon innocent people, the outbreak grows continuously at a rate of 12% per day. The outbreak begins with 80 people.

$A(t) = 80e^{0.12t}$ $A = 80e^{0.12t}$

7. How many zombies will there be after 5 days?

$A(5) = 80e^{0.12(5)}$

$A(5) = 145.77$

145 zombies

8. How many days will it take for the zombie population to reach 3,700,000 (about the population of Los Angeles, CA)?

$3700000 = 80e^{0.12t}$

$46250 = e^{0.12t}$

$\ln 46250 = \ln e^{0.12t}$

$\ln 46250 = 0.12t \cdot \ln e$ $\log_e e = \ln e = 1$

$\frac{\ln 46250}{0.12} = \frac{0.12t}{0.12}$

90 days $\approx 89.5 = t$

9. At what rate would the zombie population be growing if it reached 190,000 people (about the population of Salt Lake City, Utah) in 20 days?

$190000 = 80e^{r(20)}$

$2375 = e^{20r}$

$\ln 2375 = \ln e^{20r}$

$\frac{\ln 2375}{20} = \frac{20r}{20}$

$38.9\% \approx 0.3886 = r$

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Now we're going to get a little more far-fetched in the scenario. Let's say that zombies produce goo that is radioactive and decays continuously with a half-life of 3 years. (That's one more danger of having zombies around.) The half-life tells us that after 3 years, only half of the amount of goo we started with is remaining.

$A = Pe^{-rt}$

10. If we start with 10 pounds of zombie goo, how much will be remaining after 5 years?

$P = 10$, $t = 5$

$\frac{5}{10} = \frac{10e^{-r(3)}}{10}$

$\frac{1}{2} = e^{-3r}$

$\ln\frac{1}{2} = \ln e^{-3r}$

$\frac{\ln\frac{1}{2}}{-3} = \frac{-3r}{-3}$

$.2310 = r$

$23.1\% = r$

$A = 10e^{-r(5)}$

$A = 10e^{-0.2310(5)}$

$A = 3.15$ lbs of goo

11. How long will it take for the amount of zombie goo to decay to an amount less than 0.5 pounds?

$0.5 > 10e^{-0.231t}$

$\ln 0.05 < \ln e^{-0.231t}$

$\frac{\ln 0.05}{-0.231} > \frac{-0.231t}{-0.231}$

$12.9685 < t$

$t > 13$ days

12. When will there be no zombie goo left?

never

2.8H Choose This, Not That

A Solidify Understanding Task

In each of the following equations, you are given two options for the next step. Your job is to pick the most productive of the two options, solve the equation and check your solution to be sure that you made the right choice. When you are finished, go back and explain why the option that you did not choose was either wrong or unproductive.

1. $\log 2x = 3$

Option 1: $2x = \log 3$ Option 2: $10^3 = 2x$

Solution: Check:

Why I didn't select Option ____:

2. $\ln(x + 3) = 2$

Option 1: $\ln x + \ln 3 = 2$ Option 2: $e^2 = x + 3$

Solution: Check:

Why I didn't select Option ____:

3. $\log_3(2x + 1) = 2$

Option 1: $3^{2x+1} = 3^2$ Option 2: $2x + 1 = 3^2$

Solution: Check:

Why I didn't select Option ____:

Sep 29-2:08 PM

4. $\log_5(2x-7) = \log_5 3$

Option 1: $2x-7=3$ Option 2: $5^3 = 2x-7$

Solution: Check:

Why I didn't select Option ____:

5. $2\log_3 x = \log_3 4$

Option 1: $2x=4$ Option 2: $\log_3 x^2 = \log_3 4$

Solution: Check:

Why I didn't select Option ____:

6. $3\ln x = \ln 16 + \ln 4$

Option 1: $\ln x^3 = \ln(16\cdot 4)$ Option 2: $3x = 16+4$

Solution: Check:

Why I didn't select Option ____:

7. $\log_2 2x - \log_2(x-2) = \log_2 3$

Option 1: $\log_2\left(\frac{2x}{x-2}\right) = \log_2 3$ Option 2: $\frac{\log_2 2x}{\log_2(x-2)} = \log_2 3$

Solution: Check:

Why I didn't select Option ____:

8. $-2 = \log_x \frac{1}{9}$

Option 1: $x^{-2} = \frac{1}{9}$ Option 2: $-2 = \log_x 1 - \log_x 9$

Solution: Check:

Why I didn't select Option ____:

9. $x = \log_3 10$

Option 1: $x^3 = 10$ Option 2: $3^x = 10$

Solution: Check:

Why I didn't select Option ____:

10. $\log_a(x^2 + 1) + 2\log_a 4 = \log_a 40x$

Option 1: $\log_a 16(x^2 + 1) = \log_a 40x$ Option 2: $\log_a 8(x^2 + 1) = \log_a 40x$

Solution: Check:

Why I didn't select Option ____:

Homework

Finish 2.8H "Ready, Set, Go"

Mar 28-11:26 AM